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(71) Applicant: WHITMIRE MICRO-GEN RESEARCH LABORATORIES, INC. [US/US]; 3568 Tree Court Industrial Boulevard, St. Louis, MO 63122-6682 (US).

(72) Inventors: CLARK, Richard, J.; Route 1, Box 12M, Marion, TX 78124 (US). HILDEBRANDT, Donald, W.; 3301 Wheelock Drive, Racine, WI 53405 (US). LAWARE, Gus; 314 Big Meadows, Bandera, TX 78003 (US).

(74) Agents: RAKOCZY, Richard, E. et al.; S.C. Johnson & Son, Inc., Patent Section, 1525 Howe Street, MS 077, Racine, WI 53403 (US).

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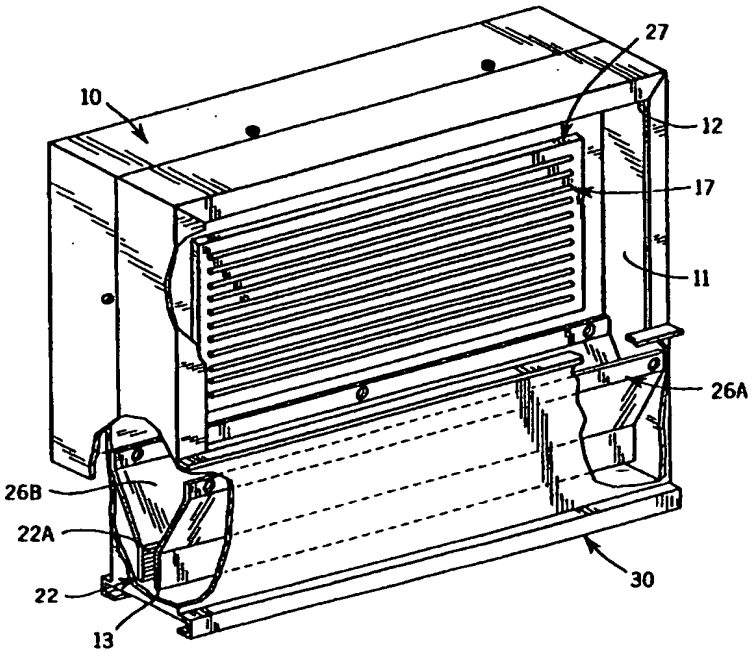
(54) Title: ELECTRONIC INSECT TRAP

(57) Abstract

An electronic trap (10) for flying and other insects is disclosed. Flies are attracted to the trap (10) by an ultra violet light source (14) and then contact a first conductive grid (17). The grid (17) stuns the insects which then fall down through a narrow throat (13) into a lower container (28). Adjacent the throat (13) is a second electronic grid (22) which inhibits the insects from escaping from the container (28).



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Electronic Insect Trap

Technical Field

The present invention relates to electronic devices for trapping flies and other insects.

Background Art

A variety of devices and methods have been used to trap or kill house flies and other common flying insects. These run the gamut from passive devices such as fly papers, to human-operated fly swatters, to electronic insect killers that kill by electrocution.

Prior art electrocution devices have various drawbacks. For those that require high voltages, the carrying grid must be protected by an outside protective grill with small spacings so as to prevent the insertion of fingers and other objects. This limits the amount of U.V. light available to attract flies. Also, the grills in such devices are often equipped with relatively expensive automatic power log-out devices to avoid inadvertent (or intentional) contact should they be opened or tampered with. Moreover, when an electrocuted insect dies there can be a crackling sound that is disruptive to conversation or other nearby activities.

The art sought to deal with these problems in U.S. patent 4,959,923. This patent provides a different type of electronic trap for flying insects. While the flies are still attracted to the trap by a U.V. light source, they contact a low power conductive grid that has spaced alternative areas of opposite potential. The electricity

stuns the insects, but does not kill them. This causes the insects to dive (or fall) down onto fly paper at the bottom of the trap.

However, the above system is so effective that in areas with very high insect populations the fly paper needs to be replaced frequently.

Electrical wires or grids capable of stunning insects have also been used to retain crawling insects such as cockroaches within open-topped cages or aquariums to keep them from crawling up the side and out of the enclosure.

A need therefore exists for an improved electronic insect trap that avoids the need for such frequent maintenance.

Disclosure Of The Invention

In one aspect, the invention provides an electronic insect trapping device suitable to be linked to an electricity supply. An external housing has a cavity therein, an opening through one face, and a throat below the cavity. There is also at least one insect attractant. This is preferably a source of light (preferably U.V. light) for providing the light in the cavity.

A first electrically conductive structure for incapacitating insects such as by stunning them is positioned within the cavity and is connectable to the electricity supply. A second electrically conductive structure is positioned adjacent the throat and is also connectable to the electricity supply. There is also a container removably connectable to the housing which extends under the throat. The second electrically conductive structure retains the insects within the container.

In one embodiment, the throat comprises two sloped walls which are separated by a narrow gap. The second electrically conductive structure comprises a plurality of electronic grids, at least one being positioned on one such wall and another being positioned on an opposed such wall. The throat thus creates a narrow passageway between the cavity and the container which preferably has a size (across the gap) of less than about one-half inch (1.27 centimeters - "cm"). The throat and second electrically conductive structure thus cooperate to retain the insects within the container.

In a preferred form, the container is a bag (e.g. a plastic garbage bag) having an upper-end that can be easily mounted onto a lower housing flange. The bag is positioned so as to receive insects that fall down through the throat.

In an alternative embodiment, the first conductive structure may be omitted. Furthermore, the interior of the cavity may be coated with a slippery material such as oil, grease, silicone oil and the like to cause the insects to fall down the cavity and into the container where they are trapped.

The first electrically conductive structure can have projections which extend into the cavity (e.g. round wires having a diameter of between 0.05 inches and 0.125 inches (0.127 cm and 0.318 cm)). There is also preferably a means for converting electric current to a form effective to energize the first structure with time-cycles of pulsed electric current and a wall which is at least partially ultra violet (U.V.) light transparent (with the U.V. light source being on one side of the wall and the first electrically conductive structure being in the cavity on an opposed side of the wall).

The trap is configured such that the U.V. light attracts insects into the cavity. The first electrically conductive

structure stuns, but usually does not kill the insects. The insects fall down through the throat to the bag. The second electrically conductive structure inhibits the insects from escaping from the container up through the throat as the throat is essentially surrounded by continuously active stun zones.

Many different types of insect pests can be trapped and accumulated for disposal with the device of the present invention. They include house flies (a general nuisance, spread disease in homes and food preparation areas, and spot eggs in poultry farms), horse flies, horn flies, face flies (spread disease in cattle), soldier flies, flesh flies, cluster flies, darkling beetles (damage wood and other structures housing poultry) and so forth.

The present invention works without high voltage electrocution of insects. It thus has the advantages of the 4,959,923 system. However, the present system has a much larger capacity and fly paper is no longer needed.

An important aspect of the invention is that insects surviving the fall into the bag and seeking to escape up the throat face the second power grid. The small size of the throat leads insects to try to land on the second grid (and then walk up the throat). This re-stuns the insects. This continues until the insects no longer have any more desire or energy to try to escape. The insects will then starve (or suffocate) and die. Given the relatively large size of the bag, the system needs much less frequent maintenance.

By careful design of the size of the throat gap, preferably greater than one-eighth inch (0.318 cm) and less than one-half inch (1.27 cm) (three-eighth inch (0.953 cm) being preferred) the flies are provided with sufficient room to fall down through the throat and normally not clog the throat. Yet, insects are unable to readily escape.

Surprisingly, there is a size range where there is enough room for the insects to fall down but not so much as to let insects easily avoid the second stun grid.

The objects of the present invention therefore include providing:

(a) a device for trapping insects, especially flying insects, of the above kind which is relatively silent in operation and can be used in areas which have very high population of insects;

(b) a device for trapping insects, especially flying insects, of the above kind which reduces the need for frequent maintenance and eliminates the need for an adhesive or sticky paper such as fly paper;

(c) a device for trapping insects of the above kind which is effective in operation while avoiding the use of chemical pesticides which are becoming less desirable from an environmental standpoint and to which insects have a tendency to become resistant

(d) a device that can be used in areas where food is exposed when the device does not use electrical grids that electrocute insects and thereby scatter body parts out of the device; and

(e) a method of trapping insects of the above kind that uses such traps.

These and still other objects and advantages of the present invention will be apparent from the descriptions which follows. The following description is merely of the preferred embodiments.

Brief Description Of The Drawings

Fig. 1 is a perspective view of a fly trap of the present invention, with its front face plate removed and with certain portions broken away;

Fig. 2 is a perspective view of the front face plate; and

Fig 3 is a schematic sectional view of the present invention in which a bag has been mounted on the lower portion of the Fig. 1 housing and the front face plate of Fig. 2 has been positioned adjacent the front of the housing.

Best Modes For Carrying Out The Invention

There is an external housing (generally 10) having an internal cavity 11, an opening 12 through a face thereof, and a throat 13 below the cavity 11. There is also at least one source of U.V. light 14 connected to the housing 10 (e.g. three fifteen watt U.V. lamps). These are preferably positioned in a box 15 past the housing 10. The front of the box 15 is a panel 27 which is a clear acrylic plastic that transmits U.V. light into the internal cavity. The U.V. light is also visible through slots 19 of front panel 18 when the panel 18 is mounted on the front of the housing 10.

There is a first electrically conductive wire grid 17 which is mounted in front of panel 27. It can be suspended from the top or sides of the housing (not shown). The grid is preferably provided with 36 volt alternating current ("A.C.") pulses of power through round stainless steel wires 17 which are .093 inch (0.236 cm) (or alternatively between 0.05 and 0.125 inches (0.127 and 0.318 cm)). The wires are alternatively negatively and positively charged and are provided with pulses of electricity as described in U.S.

patent 4,696,126 or 4,959,923 which is hereby incorporated by reference to teach such grids and the method of their operation.

The round shape of the wires allows the flies to grip (and thus have more contact with) the grid. This provides a stronger stun disorientation for a given voltage. The grid preferably has five seconds for a cycle of which one second is on and four seconds are off. Throat 13 is funnel shaped 21 at its upper end (as best shown in Fig. 3). There is a front sloped panel 26A and a rear sloped panel 26B (see Fig. 1). These panels extend the length of the trap and define at their lower end a narrow gap between them at the narrow point of the throat.

Adjacent the throat is the second electrically conductive structure 22. As shown in Fig. 3 it can be connected to an electrical supply 24 (note also that the electrical supply 24 can be connected to the U.V. light source via wire 25 or otherwise).

In an alternative arrangement (not shown), 110/120 volt/60 hertz, or alternatively, 220/240 volt/50 hertz, current can be supplied for the three uses. One line from the supply can connect to conventional transformers and starters for the U.V. bulbs. A second line can feed a circuit board that transforms the power into 36 volts/300-360 hertz that are pulsed as described above. A third line can feed a transformer (or transforming circuit board) to yield continuous 14 to 36 volts A.C. at 50 or 60 hertz Another alternative is to have batteries provide the power with suitable transformers.

There is also container (bag) 28 having an internal void for collecting insects that fall through the throat. Near its upper end is an elastic (or alternatively a tie) 29 for retaining the bag around the flange 30 of the housing.

The second electrically conductive structure 22 is preferably two sets of printed circuit grids. Each of the grids containing four horizontally disposed lines 22A. The lines can be soldered electrical strips on a printed circuit board which carries either a negative or positive charge. The voltage at the throat can be set at 14 to 36 volts A.C. at 50 or 50 hertz. This is sufficient to prevent most insects that enter the bag from leaving it once they have fallen through the throat.

The restriction at the throat is an important aspect of the invention. If the restriction is too large, insects such as flies can readily escape. Note that once flies are in the bag they are not only motivated to leave the bag to find food, they are somewhat attracted to try to leave back out through the throat due to the U.V. light in cavity 11. Thus, it is very important that the throat not be too large.

Moreover, if the throat is too narrow it can clog with larger insects (e.g. moths). The range of above about an eighth of an inch (0.318 cm) to about one-half inch (1.27 cm) is a range where most common flying insect pests normally drop freely through without clogging, yet do not readily escape. Those skilled in the art will be able to readily determine the appropriate throat size to cooperate with the electrically conductive grid used to retain the insects of interest within the container.

Industrial Applicability

Panel 18 is assembled onto the housing 10 and the power supply is connected to electricity so that the grids are activated (as is the U.V. light). An insect attracted through openings 19 would enter the cavity and be attracted towards the transparent wall 27. Upon contacting two

adjacent wires 16 a sufficient charge goes through the insects as to stun them (but not kill them). They would then drop through the funnel and then bounce or fall through the throat into the bag 28. When they recover sufficiently to try to escape, the continuously active grid 22 re-stuns them. Once a sufficient number of insects have been collected in bag 28 (a much longer time than needed to use up a fly paper sheet) the bag can be removed and emptied (e.g. by restretching elastic 29 or alternatively removing tie 29 if there is a tie). This system may be most useful in agricultural and livestock applications (e.g. cattle and dairy farm barns; poultry houses; and horse stables). Another potential use is commercial kitchens (e.g. in restaurants) as well as in homes with an appropriate sized container. It should also be useful in many other environments.

To test the system we first operated a trap of the above type in a closed test chamber containing a large population of house flies. After 24 hours about 90% of the flies in the room had been trapped.

We then tested the invention in a poultry house. After 14 days of operation a fifty-five gallon (208 liter) garbage bag (which was the attached container) had been more than half filled with trapped insects.

While the foregoing describes preferred embodiments, the above details have been set forth for purposes of illustration. It will be apparent to those skilled in the art that the invention can be used in many additional embodiments within the scope of the claims. For example, the throat could be formed in a cylindrical shape (rather than by two walls). Further, the U.V. light source need not be in a separate box.

Moreover, as shown in Fig. 3, a hinge 31 can be provided on panel 27 so that the panel can swing forward so that the U.V. bulbs 14 can be changed from the front of the device. Also, while a U.V. light is the preferred attractant, other attractants might also be used. For example, other lights or known chemical attractants (e.g. pheromones) might be used. It will also be appreciated that various types of collection containers can be used instead of a bag (e.g. boxes).

As noted above, although the invention has been described primarily in conjunction with trapping flying insects, it will also be understood that it can also be used, in conjunction with a suitable attractant such as a pheromone or U.V. light, for the trapping of insects, with or without a grid to stun the insects, for example, to trap darkling beetles, which along with flies, present a significant insect pest nuisance in poultry houses.

The claims should be therefore looked to determine the full scope of the invention.

Claims

We claim:

1. An electronic flying insect trapping device suitable to be linked to an electricity supply, comprising:

an external housing having a cavity therein, an opening into the cavity through the housing, and a throat below the cavity;

an attractant, forming a part of the device, that can attract flying insects into the cavity;

a first electrically conductive structure for incapacitating insects that is located within the cavity and is connectable to an electricity supply;

a container removably connectable to the housing which extends under the throat to receive insects passing through the throat from the cavity; and

a second electrically conductive structure positioned adjacent the throat which is also connectable to an electricity supply and that cooperates with the throat to retain insects passing through the throat within the container.

2. The trapping device of claim 1, wherein the attractant is a source of U.V. light that is capable of providing U.V. light in the cavity.

3. The trapping device of claim 2, wherein the second electrically conductive structure comprises a plurality of electronic grids, at least one being positioned on one side of the throat and another being positioned on an opposed side of the throat.

4. The trapping device of claim 3, wherein the grids are positioned no greater than one-half inch (1.27 cm) apart across the throat in at least one horizontal direction.

5. The trapping device of claim 2, wherein the container is a bag.

6. The trapping device of claim 2, wherein the first electrically conductive structure has electrically conductive projections which extend into the cavity.

7. The trapping device of claim 6, wherein the projections are rounded wires having a diameter of between .05 inch (0.127 cm) and .125 inches (0.318 cm).

8. The trapping device of claim 2, further comprising means for converting electricity to a form effective to energize the first structure with timed cycles of a pulsed electric current.

9. The trapping device of claim 2, further comprising a wall linked to the housing which is at least partially ultra violet light transparent, the U.V. light source being on one side of the wall, and the first electrically conductive structure being on an opposed side of the wall.

10. An electronic insect trapping device suitable to be linked to an electricity supply, comprising:

an external housing having a cavity therein, an opening into the cavity through one housing face, and a throat below the cavity;

an attractant, forming a part of the device, that can attract insects into the cavity;

a first electrically conductive structure that is located within the cavity and is connectable to an electricity supply;

a container removably connectable to the housing which extends under the throat to receive insects passing through the throat from the cavity; and

a second electrically conductive structure positioned adjacent the throat which is also connectable to an electricity supply,

wherein the device is configured such that the attractant can attract insects into the cavity, the first electrically conductive structure is capable of stunning insects and causing them to drop through the throat into the container, and the second electrically conductive structure is capable of inhibiting insects that have dropped into the container from escaping from the container back up through the throat which is also of a size that cooperates with the second electrically conductive structure to inhibit insects passing through the throat from escaping from the container back up through the throat.

11. The trapping device of claim 10, wherein the device is configured such that the attractant can attract flying insects into the cavity, the first electrically conductive structure is capable of stunning flying insects and causing them to drop through the throat into the container, and the second electrically conductive structure is capable of inhibiting flying insects that have dropped into the

container from escaping from the container back up through the throat which is also of a size that cooperates with the second electrically conductive structure to inhibit flying insects from escaping from the container back up through the throat.

12. A method of trapping insects, comprising providing an electricity supply to the trapping device of claim 1 to provide an electrified trap device and making available said electrified trapping device to insects.

13. A method of trapping insects, comprising providing an electricity supply to the trapping device of claim 10 to provide an electrified trap device and making available said electrified trapping device to insects.

14. A method of trapping flying insects, comprising providing an electricity supply to the trapping device of claim 11 to provide an electrified trap device and making available said electrified trapping device to flying insects.

15. An electronic insect trapping device suitable to be linked to an electricity supply, comprising:

an external housing having a cavity therein, an opening into the cavity through one housing face, and a throat below the cavity;

an attractant, forming a part of the device, that can attract insects into the cavity;

a container removably connectable to the housing which extends under the throat to receive insects passing through the throat from the cavity; and

an electrically conductive structure positioned adjacent the throat which is also connectable to an electricity supply,

wherein the device is configured such that the attractant can attract insects into the cavity and the electrically conductive structure is capable of inhibiting insects that have dropped into the container from escaping from the container back up through the throat which is also of a size that cooperates with the electrically conductive structure to inhibit insects from escaping from the container back up through the throat.

16. The trapping device of claim 15, wherein the electrically conductive structure comprises a plurality of electronic grids, at least one being positioned on one side of the throat and another being positioned on an opposed side of the throat.

17. The trapping device of claim 16, wherein the grids are positioned no greater than one-half inch (1.27 cm) apart across the throat in at least one horizontal direction.

18. The trapping device of claim 17, wherein the container is a bag.

19. The trapping device of claim 15, wherein the insects to be trapped are flying insects.

20. A method of trapping insects, comprising providing an electricity supply to the trapping device of claim 15 to

provide an electrified trap device and making available said electrified trapping device to insects.

FIG. 1

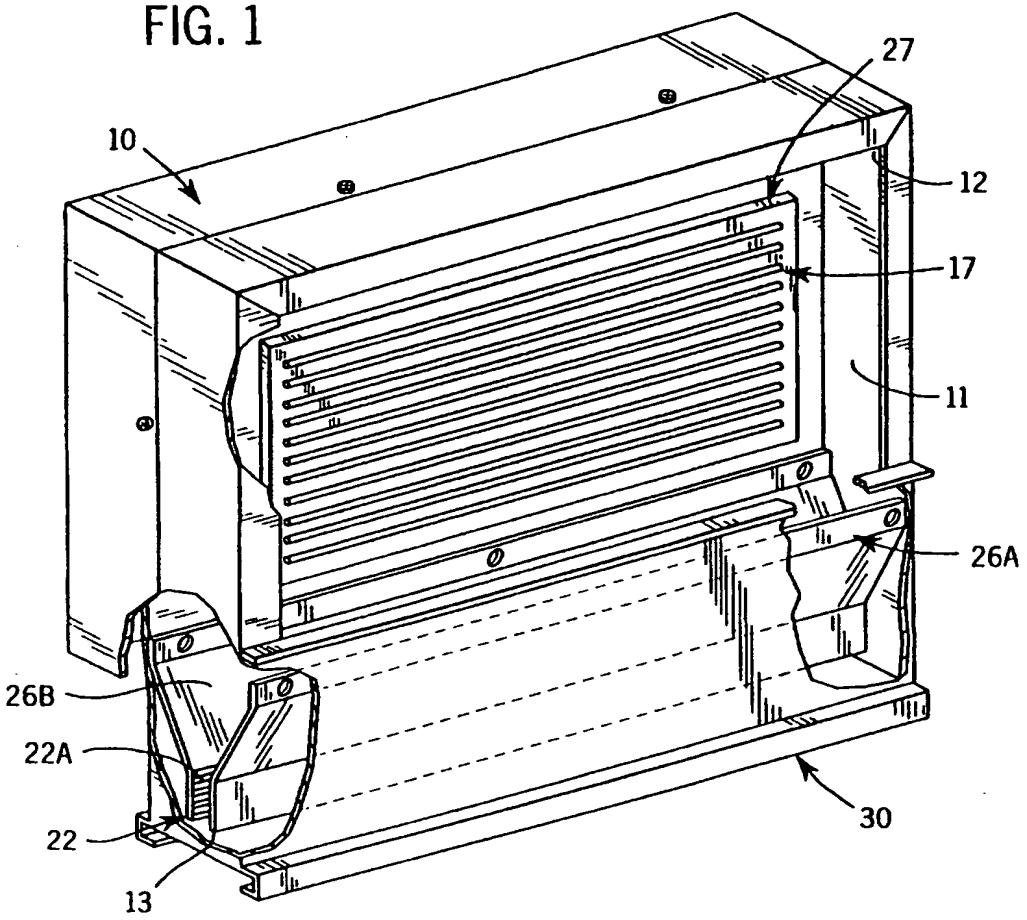


FIG. 2

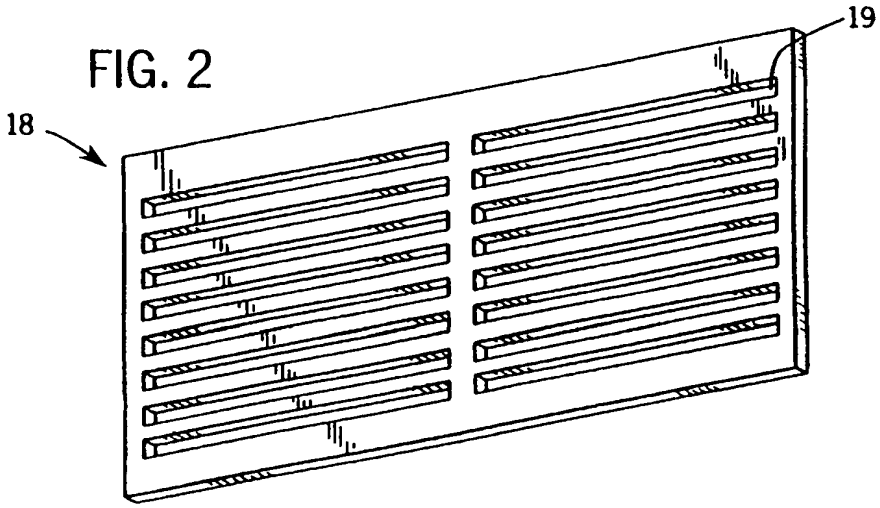
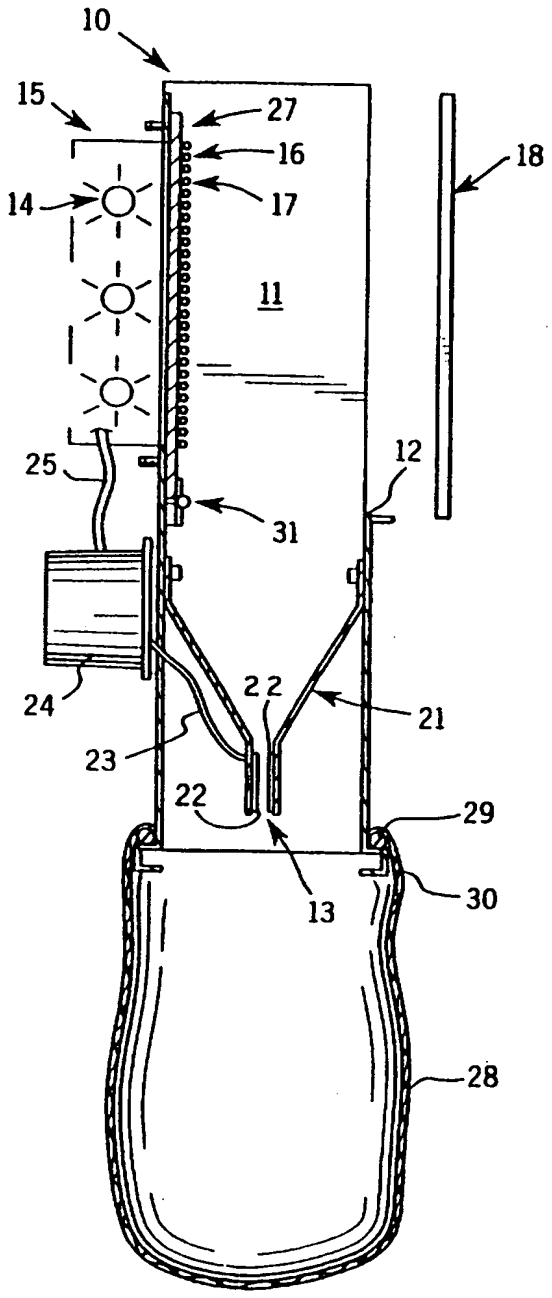


FIG. 3



INTERNATIONAL SEARCH REPORT

Inter onal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 4 959 923 A (AIELLO SALVATORE F ET AL) 2 October 1990 cited in the application see claims; figures	1,2,8,10
A	US 4 696 126 A (GROTHAUS ROGER H ET AL) 29 September 1987 cited in the application see claims; figures	1,8,10
A	FR 2 338 624 A (AMCOR LTD) 12 August 1977 see claims; figures	1

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Information on patent family members

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